1H-Benzotriazole, Tolyltriazole, 5-Methyl-1H-Benzotriazole and Groundwater

1H-Benzotriazole, Tolyltriazole, and 5-Methyl-1H-Benzotriazole

1H-Benzotriazole (BT) is a chemical used in a wide variety of industrial, commercial, and consumer products. Tolyltriazole (TTR) and 5-Methyl-1H-Benzotriazole (5-Me-BT) are chemicals closely related to BT and have similar properties and uses. These chemicals are used as corrosion and ultraviolet (UV) light inhibitors, aircraft de-icing agents, plastic stabilizers, and anti-fogging agents. They are also used in some types of pharmaceuticals, fungicides, paints, and coatings.[1, 2] BT, TTR, and 5-Me-BT are part of a large family of chemicals known as benzotriazoles.

BT, TTR, and 5-Me-BT in Minnesota Waters

BT has only been looked for in a small number of groundwater samples in Minnesota. It was detected in three of nine samples, with a maximum concentration of 0.068 micrograms per liter (µg/L). TTR was detected in 11 percent of 181 samples, with a maximum concentration of 0.78 ug/L. 5-Me-BT was detected in 2 percent of 535 samples, with a maximum concentration of 0.3 ug/L.*

In multiple studies of surface water, BT has been detected in 6 to 28 percent of samples, with a maximum concentration of 1.6 µg/L.[3] The Minnesota Pollution Control Agency (MPCA) estimates that 17 to 29 percent of river miles in Minnesota have detectable levels of BT. TTR has been detected in 100 percent of stormwater samples, while 5-Me-BT was found in 56% of samples.[4]

BT and TTR have not been looked for in Minnesota drinking water. 5-Me-BT has been looked for, but not detected, in some public drinking water supplies in Minnesota.[5]

*One microgram per liter (µg/L) is the same as one part per billion (ppb).

MDH Guidance Value

Based on available information, MDH developed a guidance value of 20 parts per billion (ppb) for BT in water. MDH has also developed risk assessment advice (RAA) for TTR and 5-Me-BT of 20 parts per billion (ppb). The risk assessment advice was derived using a surrogate approach because TTR and 5-Me-BT are similar to BT.

MDH does not use guidance values to regulate water quality, but they may be useful for situations in which no regulations exist. MDH develops guidance values to protect people who are most vulnerable to the potentially harmful effects of a contaminant. A person drinking water at or below the guidance value would be at little or no risk for harmful health effects.

Potential Health Effects

Studies on laboratory animals indicate that exposure to BT can result in decreased body weight in offspring and may result in kidney effects over time. BT has been studied in animals for cancer and was not identified as a chemical that causes cancer. The risk assessment advice for TTR and 5-Me-BT was derived using a surrogate approach because TTR and 5-Me-BT are so similar to BT. The potential health effects for all three are the same.

Potential Exposure to BT, TTR, and 5-Me-BT

You can be exposed to BT through indoor and outdoor air, food, contact with clothing and consumer products, and house dust. Several types of products found in the home, including odor concealment products and dishwashing detergents, can contain BT. Most of the ways you can be exposed to BT, TTR, and 5-Me-BT seem to be of low concern, but not many studies have examined humans exposed to BT.[6,7,8]

BT, TTR, and 5-Me-BT in the Environment

BT can enter the environment through consumer products, industrial use, and specialty uses such as airplane de-icing solutions. In the environment, BT can move through soil and groundwater. BT does not biodegrade easily in most environments, and wastewater treatment systems are only partially effective at removing BT from wastewater. BT does not tend to build up in the tissues of fish or other animals. The breakdown products are not concerning based on currently limited available information.

Potential Environment Impacts of BT, TTR, and 5-Me-BT

Health Risk Assessment Unit

The MDH Health Risk Assessment Unit evaluates the health risks from contaminants in drinking water sources and develops health-based guidance values for groundwater. MDH works in collaboration with the Minnesota Pollution Control Agency and the Minnesota Department of Agriculture to understand the occurrence and environmental effects of contaminants in water.

References

1. Hazardous Substances Data Bank. 2019. Results for "1H-Benzotriazole." From https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~r6Ut0p:1.
2. U.S. Environmental Protection Agency (EPA) CompTox Chemistry Dashboard. 2019. Results for "1H-Benzotriazole." From https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID6020147#exposure.
3. Ferrey, M.; Martinovic, D.; Backe, W.; and A. Andrews, 2017. Pharmaceuticals and chemicals of concern in rivers: occurrence and biological effects, MPCA, January 2017.
4. Fairbairn, D.J.; Elliott, S.M.; Kiesling, R. L.; Schoenfuss, H.L.; Ferrey, M.L.; and B.M. Westerhoff, 2018. Contaminants of emerging concern in urban stormwater: Spatiotemporal patterns and removal by iron-enhanced sand filters (IESFs). Water Research, 2018, 145, 332-345
5. Lee, Kathy E., Barber, Larry B., Furlong, Edward T., Cahill, Jeffery D., Kolpin, Dana W., Meyer, Michael T., and Zaugg, Steven D., 2004, Presence and distribution of organic wastewater compounds in wastewater, surface, ground, and drinking waters, Minnesota, 2000-02 U.S. Geological Survey Scientific Investigations Report, 2004-5138, 47p.
6. Wang, L., Asimakopoulos, A.G., Moon, H., Nakata, H., and Kanna, K., 2013, Benzotriazole, Benzolthiazole, and Benzophenone Compounds in Indoor Dust from the United States and East Asian Countries, Environ. Sci. Technol. 2013, 47, 4752−4759.
7. LeFevre, G. H., Lipsky, A., Hyland, K. C., Blaine, A. C., Higgins, C. P., & Luthy, R. G. (2017). Benzotriazole (BT) and BT plant metabolites in crops irrigated with recycled water. Environmental Science: Water Research & Technology, 3(2), 213-223.
8. Xue, J., Yanjian Wan & Kurunthachalam Kannan (2017) Occurrence of benzotriazoles (BTRs) in indoor air from Albany, New York, USA, and its implications for inhalation exposure, Toxicological & Environmental Chemistry, 99:3, 402-414

Minnesota Department of Health
Health Risk Assessment Unit
PO Box 64975, St. Paul MN 55164
651-201-4899
health.risk@state.mn.us
www.health.state.mn.us

CLEAN WATER LAND & LEGACY AMENDMENT

NOVEMBER 2019

To obtain this information in a different format, call: 651-201-4899.